

Appl. No. : 10/041,767
Filed : January 7, 2002

Amendments to the Claims:

Claims 19, 23, 25, 27, 47 and 52 have been amended.

The following listing of claims will replace all prior listing of the claims:

Listing of Claims:

1-17. (Canceled)

18. **(Previously presented)** A printed circuit board drilling machine in combination with a printed circuit board, the drilling machine having a worktable for supporting the printed circuit board, a spindle, a drill bit and a controller configured to instruct the drilling machine to drill to a point in the printed circuit board, to retract said drill bit a retract distance, said retract distance configured such that a tip end of said drill bit remains below a top surface of said printed circuit board and to drill a distance greater than said retract distance into said printed circuit board.

19. **(Currently amended)** The drilling machine of Claim 18, wherein said controller is further configured [[the]] to retract said drill bit a retract distance and to drill to a distance greater than said retract distance until a final depth is reached.

20. **(Previously presented)** The drilling machine of Claim 19, wherein said controller is further configured to completely withdraw said drill tip from said printed circuit board after said final depth is reached.

21. **(Original)** The drilling machine of Claim 18, wherein said controller is further configured to receive said retract distance from an operator.

22. **(Original)** The drilling machine of Claim 18, wherein said controller is further configured to calculate said retract distance from a set of operational data that is inputted into said controller by an operator.

23. **(Currently amended)** The drilling machine of Claim 18, wherein said controller is further configured to receive data indicating a stack height and a number of increments from an operator and to calculate the retract ~~height~~ distance from said stack height and said number of increments.

24. **(Original)** The drilling machine of Claim 18, wherein said controller is further configured to receive data indicating a hole depth and a number of increments from an operator and to calculate the retract height from said hole depth and said number of increments.

25. **(Currently amended)** The drilling machine of Claim 18, wherein said controller is further configured to drill to a first depth in said printed circuit board[[]]and to completely withdraw said drill bit from said printed circuit board.

26. **(Original)** The drilling machine of Claim 18, wherein said controller is further configured to retract said drill bit a retract distance and to drill to a distance greater than said retract distance until a final depth is reached and said retract distance is uniform.

27. **(Currently amended)** The drilling machine of Claim 18, wherein said controller is further configured to retract said drill bit a retract distance and to drill to a distance greater than said retract distance until a final depth is reached and said retract distance is non-uniform.[[.]]

28. **(Original)** The drilling machine of Claim 18, wherein said controller is further configured to retract said drill bit a retract distance and to drill to a distance greater than said retract distance until a final depth is reached and said distance greater than said retract distance is uniform.

29. **(Original)** The drilling machine of Claim 18, wherein said controller is further configured to retract said drill bit a retract distance and to drill to a distance greater than said retract distance until a final depth is reached and said distance greater than said retract distance is non-uniform.

30. **(Original)** The drilling machine of Claim 18, wherein said controller is further configured to retract said drill bit a retract distance and to drill to a distance greater than said retract distance until a final depth is reached and said retract distance is uniform and said distance greater than said retract distance is uniform.

31. **(Original)** The drilling machine of Claim 18, wherein said controller is further configured such that to reduce an axial speed of the drill bit, while drilling a distance greater than said retract distance, from a first axial speed to a second axial speed when the drill bit when the drill bit passes a deceleration point.

32. **(Original)** The drilling machine of Claim 31, wherein said controller is further configured to receive the deceleration point and the first axial speed from an operator.

33. **(Original)** The drilling machine of Claim 32, wherein said controller is further configured to, while said drill bit is being retracted, reduce from a first axial speed to a second axial speed when the drill bit passes a deceleration point.

34. **(Original)** The drilling machine of Claim 33, wherein said controller is further configured to receive the deceleration point and the first axial speed from an operator.

35. **(Previously presented)** A method for operating a printed circuit board drilling machine having a worktable, a spindle, a drill bit and a controller configured to control the operation of the drilling machine, the method comprising the steps of:

positioning a printed circuit board on the worktable;

drilling to a point in the printed circuit board;

retracting said drill bit a retract distance, said retract distance configured such that a tip end of said drill bit remains below a top surface of said printed circuit board,

drilling a distance greater than said retract distance into said printed circuit board.

36. **(Original)** The method of Claim 35, further including repeatedly retracting said drill bit a retract distance and drilling a distance greater than said retract distance until a final depth is reached.

37. **(Previously presented)** The method of Claim 36, further including completely withdrawing said drill tip from said printed circuit board after said final depth is reached.

38. **(Original)** The method of Claim 35, further including receiving said retract distance from an operator.

39. **(Original)** The method of Claim 35, further including calculating said retract distance from a set of operational data that is inputted into said controller by an operator.

40. **(Original)** The method of Claim 35, further including receiving data indicating a stack height and a number of increments from an operator and configuring and calculating the retract height from said stack height and said number of increments.

41. **(Original)** The method of Claim 35, further including receiving data indicating a hole depth and a number of increments from an operator and calculating the retract height from said hole depth and said number of increments.

42. **(Previously presented)** The method of Claim 35, further comprising drilling to a first depth in said printed circuit board and completely withdrawing said drill bit from said printed circuit board.

43. **(Original)** The method of Claim 35, further including retracting said drill bit a retract distance and drilling to a distance greater than said retract distance until a final depth is reached, wherein said retract distance is uniform.

44. **(Original)** The method of Claim 35, further including retracting said drill bit a retract distance and drilling to a distance greater than said retract distance until a final depth is reached, wherein said retract distance is non- uniform.

45. **(Original)** The method of Claim 35, further including retracting said drill bit a retract distance and drilling to a distance greater than said retract distance until a final depth is reached, wherein said distance greater than said retract distance is uniform.

46. **(Original)** The method of Claim 35, further including retracting said drill bit a retract distance and drilling to a distance greater than said retract distance until a final depth is reached, wherein said distance greater than said retract distance is non-uniform.

47. **(Currently amended)** The method of Claim 35, further including retracting said drill bit a retract distance and drilling to a distance greater than said retract distance until a final depth is reached, wherein said [[aid]] retract distance is uniform and said distance greater than said retract distance is uniform.

48. **(Original)** The method of Claim 35, further comprising, while drilling a distance greater than said retract distance, reducing an axial speed of the drill bit from a first axial speed to a second axial speed when the drill bit passes a deceleration point.

49. **(Original)** The method of Claim 48, further comprising receiving the deceleration point and the first axial speed from an operator.

50. **(Original)** The method of Claim 35, further comprising, while retracting said drill bit, reducing an axial speed of the drill bit from a first axial speed to a second axial speed when the drill bit passes a deceleration point.

51. **(Original)** The method of Claim 50, further comprising receiving the deceleration point and the first axial speed from an operator.

52. **(Currently amended)** A method for operating a printed circuit board drilling machine having a worktable for supporting a plurality of circuit boards, a plurality of spindles each associated with a drill bit, and a controller configured to control the operation of the drilling machine, the method comprising the steps of:

positioning the plurality of circuit boards on the work table such that each of the plurality of circuit boards is associated with a spindle and a drill bit;

drilling to a point within each of the plurality of printed circuit boards;

retracting said plurality of drill bits a retract distance, said retract distance configured such that a tip end of said plurality of drill bits remains below a top surface of each of said plurality of printed circuit boards,

drilling a distance greater than said retract distance into each of said plurality of printed circuit boards,

retracting said plurality of drill bits a second retract distance, said second retract distance configured such that a tip end of said plurality of drill bits remains below a top surface of each of said plurality of printed circuit boards,

drilling a distance greater than said second retract distance into each of said plurality of printed circuit boards

retracting said plurality of drill bits a third retract distance, said third retract distance configured such that a tip end of said plurality of drill bits remains below a top surface of each of said plurality of printed circuit boards, and

drilling a distance greater than said third retract distance into each of said plurality of printed circuit boards.

53. **(Previously presented)** The method of Claim 52, further comprising moving each spindle and drill bit with respect to their associated circuit board.

54. **(Previously presented)** The method of Claim 53, wherein moving each spindle and drill bit with respect to their associated circuit board comprises moving the work table.